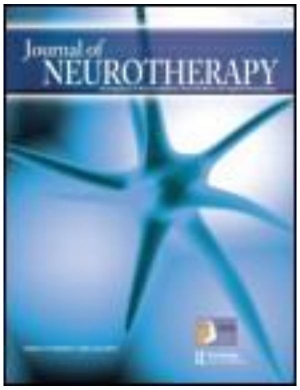

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Integrative Approach to High-Performance Evaluation and Training: Illustrative Data of a Professional Boxer

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OBSERVATIONS IN PEAK PERFORMANCE TRAINING

INTEGRATIVE APPROACH TO HIGH-PERFORMANCE EVALUATION AND TRAINING: ILLUSTRATIVE DATA OF A PROFESSIONAL BOXER

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This article describes a specific and unique performance enhancement training paradigm for an elite heavyweight boxer currently competitive and successful in his sport. The athlete was a 27-year-old male professional boxer. He participated in our multifaceted training program beginning in 2009, though he still actively participates to date. Extensive nutritional, sport psychology, and cortical functioning assessments were conducted at baseline. The results from the training program, as judged by objective data and self-report at posttraining evaluations, are discussed here. Among the many nutritional advantages he gained, the athlete was able to decrease his risk for coronary artery disease, increase lean mass, decrease unnecessary immune system strains, and decrease body fat percentage by 6%. With regard to his mental skills, the athlete offered self-report that he is able to narrow his focus to the objective at hand and stay in a calm frame of mind both before and during his competitive rounds. His brain physiology also showed gains in focus, reaction speed variability, and improved impulse control demonstrated by fewer errors in the posttraining evaluation. The current case study supports previous findings with our multimodal high-performance training approach (Sherlin, Gervais, Talley, & Walshe, 2011) and further evidences the need to incorporate more core training areas concurrently in order to achieve high performance in elite athletes.

INTRODUCTION

The scientific literature in high performance training often focuses on singular techniques rather than more dynamic, ''on the field'' training paradigms. Research has consistently demonstrated that athletes of all skill levels benefit from a number of training approaches, including balance exercises (e.g., Hrysomallis, 2011; Pau, Loi, & Pezzotta, 2012), muscular strength training (e.g., Anderson et al., 1991; Louis, Hausswirth, Easthope, & Brisswalter, 2011), and cardiovascular endurance training (e.g., Noakes, 2000; Radovanovic et al., 2011). Yet it is common practice for athletic coaches to utilize various tactics in a simultaneous fashion to improve the performance of individual athletes or entire teams. Clearly coaches believe that a combination of these methods in conjunction with sport-specific skills practice leads to peak performance. This multifaceted approach becomes a requirement when working with elite athletes, where performance advances come in minute gains. It is no longer enough to provide only skill and muscular training to athletes; instead we must dive deeper into the athlete's physiology and begin utilizing as many scientifically validated training approaches as feasible.

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For this reason, we believe that a more complex training paradigm should be utilized (Sherlin, Gervais, Talley, & Walshe, 2011). Advancements in technology can now be integrated into unique and dynamic athletic training methods that can serve to propel elite performers further toward their ultimate goals. Together with more traditional training models, this specialized yet boarder approach is a driving force in what is becoming a ''complete high performance science that is capable of incorporating physiology, psychology, traditional sport coaching, biomechanics, and nutrition'' (Sherlin et al., 2011, p. 119). On this premise, we devised a distinct training model (Sherlin et al., 2011) that incorporates nutrition, mental/emotional control, and cortical function.

This article describes our efforts to replicate that multifaceted approach with a professional heavyweight boxer currently involved and very successful in the sport. In 2009, this athlete agreed to participate in our unique training paradigm with the hopes of maximizing his performance. Professionals in the fields of nutrition science, sport psychology, and neurophysiology composed the performance team of experts working with the athlete. Initial assessments were conducted by each member of the performance team and included comprehensive interviews pertaining to the athlete's goals, strengths, weaknesses, training behavior, nutritional needs, and global beliefs, among other things. Blood and urine analysis, subjective performance-based assessments, body composition measures, and a quantitative electroencephalograph (QEEG) were also conducted. We believe it is necessary to assess each of these areas in a parallel and continuous fashion, as they all overlap daily in the athlete's body. The extensive nature of our assessments affords us the opportunity to understand the entire performance profile of this athlete and illuminates the most effective design for the subsequent training program.

NUTRITIONAL SUPPORT

The impact of nutrition on health has received much deserved attention in recent years, especially in relation to how it impacts athletic performance (e.g., American Dietetic Association et al., 2009). It is generally accepted that the consequences of poor nutrition for an athlete can include underperformance, exhaustion, muscle cramps, and injuries. Beyond this, nutrients serve as the fuel for the machine that is an athlete's body, meaning that adequate quality *and* quantity of nutrient intake can provide a competitive advantage (Williams & Devlin, 1992). Consequently, diet modifications as they relate to the health and functioning of the athlete are indispensable in peak performance training of elite athletes. There can be an array of differences among athletes in genetic composition, environment, behavior, sport, and skill level. Given this, a complete nutritional examination including biochemical analysis through blood and urine sampling along with self-reported information regarding diet, feasible nutrition modifications, and sport-specific requirements is one practice to achieve performance enhancement in elite athletes. Furthermore, toxins and allergens present in food and other ingested substances can tax the immune system of an athlete and hinder the body's ability to recovery from practice and competition; therefore, they should be taken into account, and exposure should be limited as part of the entire nutritional modification strategy (Sherlin et al., 2011).

Our nutrition expert required a Complete Blood Count, Comprehensive Metabolic Panel, a sex hormone panel, and basic lipoprotein profile in addition to screening for an extensive number of common food sensitivities, essential fatty acids and their derivatives, amino acids, and heavy metal toxicities. Vitamins and minerals, energy production metabolites, neurotransmitter metabolism markers, impaired detoxification indicators, and gut microbial imbalances were also evaluated.

The initial nutritional assessment revealed that this elite boxer had an abundance of risk factors for coronary artery disease including elevated levels of trans-fatty acids, total cholesterol, LDL cholesterol, and Lipoprotein (a), as well as an elevated ratio of arachidonic acid to eicosapentaenoic acid (D'Agostino, Grundy, Sullivan, & Wilson, 2001; Ford, Giles, & Mokdad, 2004; Schreiner et al., 1993). In addition, blood analysis detected slightly elevated levels of heavy metals and a moderate IgG4 food sensitivity to eggs, which can negatively impact the central nervous system and unnecessarily tax the immune system, respectively. The athlete also presented with extraordinarily low vanilmandelate and homovanillate scores, which serve as markers of norepinephrine/epinephrine and dopamine metabolism, respectively. Low scores indicate that there may be an underproduction or poor metabolism of norepinephrine, epinephrine, and dopamine. Furthermore, a substantial plasma tyrosine deficiency was observed, leading to the possibility that the depressed vanilmandelate and homovanillate values were due to insufficient intake/production of tyrosine. He also presented a significantly elevated urinary suberate score, indicating that this athlete may not have been properly metabolizing fatty acids. For the body composition measurements at baseline he weighed 237.5 lb and using Lange skin-fold calipers it was calculated that he had 25% body fat. Finally, at the initial assessment, the athlete reported inflammation and pain in multiple joints.

Recommendations derived from the initial assessment were based upon the results of his blood and urine analysis combined with his self-reported performance-related input. It should also be stated that the recommendations were limited in scope of intervention to only those areas deemed most important in order to enhance compliance. First, to address the prevalent risk factors of heart disease, he was advised to reduce the amount of "junk food" and fatty red meat he was ingesting, while also supplementing his diet with fish oils, select B vitamins, antioxidants, and oatmeal. In addition, N-acetyl-L-cysteine (NAC), alpha lipoic acid, and glycine were recommended supplements. Due to the food sensitivity, he was advised to reduce his egg intake. Carnitine supplementation was also suggested based on an elevated suberate score. Based on expert opinion of his needs for the sport of boxing, supplemental phosphatidylserine, alpha-glycerophosphocholine, and D-Ribose were added to his diet plan. He was placed on a software generated meal program containing 1.0 gram of protein, 2.5 grams of carbohydrate, and 0.75 grams of fat per pound of lean body mass per day. The meals he received were continually adjusted based on changes in his lean body mass. The nutrition plan was designed to incorporate the majority of the nutrients he needed into the meals, as he expressed an aversion to swallowing pills. Meals were prepared for him on a daily basis to ensure compliance, with 1 day per week programmed as a "free day," to allow him some flexibility in his social schedule.

After 1 year that included nutritional counseling, monthly body fat assessments, dietary modifications, and supplementation, a complete nutritional assessment was conducted again. The results indicated that the boxer was compliant with many of the recommendations. To start, substantially reduced values were recorded for total cholesterol (215 mg/dL to 189 mg/dL), LDL cholesterol (143 mg/dL to 127 mg/dL), and trans-fatty acid levels (43 uM to 20 uM). Lipoprotein (a) values remained unchanged. The improvements in the majority of his lipoprotein values should help with overall body function, cardiovascular health, and disease prevention. There was a vast improvement in all Omega-3 fatty acid levels, including a significant decrease in the ratio between Arachidonic acid and Eicosapentaenoic acid (22:1 to 13:1), which relates to his performance through reduced blood viscosity and decreased inflammatory response (Simopoulos, 2007). Of interest, there was a significant increase in free testosterone (643 ng/dL to 703 ng/dL) and, although it was not significantly low to begin with, an increase may help with recovery and increase hypertrophic response to resistance training. Postintervention, the boxer registered below the national average for heavy metals, which decreases the likelihood of impairments in nervous system function. Suberate values returned to normal, indicating proper utilization of fatty acids during exercise (Gonzalez & Stevenson, 2012). IgG4 egg white antibodies were substantially reduced (429 ng/mL to 51 ng/mL), translating to reduced immune system load and the freeing up of resources for recovery purposes.

All body composition values improved, as there was a 6% decrease in percentage body fat (25% to 19%) and 1.5 lb were gained (237.5 lb to 239 lb), implying that more than 15 lb of lean body mass was added. These are impressive changes considering that his resistance training program remained nearly identical to his preintervention program. The boxer also noted improvements in the visual appearance of his abdominal musculature, likely due to the 6% decrease in body fat and substantial gain in lean body mass. Other self-reported improvements included decreased inflammation and joint pain, improved hand speed and reaction time, noticeable improvements in his visual discrimination and color differentiation abilities, as well as improved cardiovascular and muscular endurance.

Areas of less significant success included B vitamin metabolism markers that remained slightly elevated, indicating a continued unmet need for B vitamins. This may impact many metabolic pathways, from energy production to hormone production. Also demonstrating less success were his depressed vanilmandelate and homovanillate scores (which relate to the production and metabolism of norepinephrine, epinephrine, and dopamine). The athlete did report substantial compliance issues with the B vitamin and L-Tyrosine supplementation, which may have contributed to the lack of significant progress in these areas. Going forward, B vitamins will be incorporated into his meals, and compliance strategies, like weekly check-ins, will be explored for the L-Tyrosine supplementation. Adjustments were made to his food and dietary supplement regimen and another follow-up test was scheduled to be performed in 1 year, a time frame that was influenced by the boxer and to ensure that the erythrocytes being assessed in the blood analysis are an entirely new sample.

APPLICATION OF SPORT PSYCHOLOGY

The mental skills of an athlete play an important role during performance and should not be ignored. Just as physical capabilities have to be measured and subsequently trained, so too should mental and emotional skills. Sport psychologists often measure these attributes in an athlete to gain insight into the intrinsic belief systems of the individual (Sherlin et al., 2011). Subsequently, those insights can translate into high-performance attainment upon refinement of mental skills. The addition of sport psychology to the coaching staff of elite athletes has become more and more popular over the years, as athletes and coaches have begun to recognize that cognitive performance cannot be separated from physical performance.

During a formal intake interview, our sport psychologist ascertained the athlete's boxing-related concerns and goals as well as administered the Test of Attentional and Interpersonal Style (TAIS) inventory (Nideffer, 1976). This self-report, subjective assessment tool comprises 144 items designed to measure the athlete's perceived concentration, attentional, and interpersonal styles as they relate to performance. Norms are based on national-level male athletes.

The interview and TAIS assessment results indicated an athlete who has a reported healthy self-confidence, has a strong belief in his ability to perform under pressure, prefers fast-paced activities, has a need to engage physically, and has a reported attentional appreciation for having situational awareness. This boxer scored high in appreciation for risk taking and making quick decisions, but compared to the normative reference group he may make decisions too hastily without enough information. In addition, he reported high preferences for both extroverted and introverted interpersonal styles. Analysis suggests that this boxer's two most likely errors under pressure are overthinking and anger/frustration. Subsequent training strategies included varied cognitive behavioral skills and interventions to include arousal regulation, self-talk, effective goal setting, preperformance planning, imagery, and varied mindfulness practices to increase awareness of facilitative and debilitative mental activity. Additional strategies included resiliency skills to moderate his coping tendencies. To enhance those mental skills the boxer met with the sport psychologist as part of boxing camp three times a week for 8 months. After camp, they met for one session a week for 3 months and then decreased to once every 2 months. Currently, his mental strategy training involves primarily pre-event strategies and refinement of skill.

After the aforementioned regimen of training with the sport psychologist, the athlete reported having increased ability to recognize goals and suppress excessive thoughts that were noncontributory to the performance objectives both prior to the match and during the performance. The primary reported outcomes were an increased awareness and control of self-talk; specifically, he was able to reduce unnecessary mental chatter and remain in a calm and focused mind-set.

PERFORMANCE BRAIN TRAINING

Finally, if the brain is the epicenter of cognitive processing, skill integration, and recalling relevant information, then it is an obvious new frontier for performance-enhancement training (Harung et al., 2011; Thompson, Steffert, Ros, Leach, & Gruzelier, 2008). QEEG techniques to measure specific electrical activity in the cortex have been recognized to reflect levels of cognitive engagement and arousal regulation (Duffy, McAnulty, Jones, Als, & Albert, 1993; Sherlin et al., 2011). Further, elite athletes have demonstrated distinct differences in EEG activity relative to novices (Vernon, 2005), particularly in critical variables like engagement and arousal that can impact execution of skills (e.g., Baumeister, Reinecke, Liesen, & Weiss, 2008). The logical next step is to apply performance brain training for a competitive advantage through heightened awareness of cortical activity and to enhance the volitional control of brain states (Sherlin et al., 2011).

In the current study, our expert in neurophysiology required the boxer to undergo a NeuroPerformance Profile™ (Sherlin & Hixon, 2011) assessment to compare his cortical activity with other elite athletes during baseline, eyes closed and open, and activation task (continuous performance task [CPT]) conditions. The NeuroPerformance Profile provides an analysis of multiple metrics related to sport performance that are derived from combining behavioral information from CPT (BEE Medic GmbH, Kirchberg, Switzerland) and QEEG spectral data from a 19-channel EEG recording with a standard International 10-20 electrode placement system (Sherlin et al., 2011; Sherlin, Larson, & Sherlin, 2012). This unique combination of information from the NeuroPerformance Profile allows the practitioner to design maximally effective brain-training protocols, in addition to providing insight about the athlete's strengths, weaknesses, and preferences to coaches and trainers.

The initial NeuroPerformance Profile conducted in 2011 revealed the lowest index to be the Stress Index. Within the Stress Index the Stress Recovery scale and within the Focus Index the NeuroStrength scale were the weakest scales scored at 50% of the 0-to-100% range. Other scales within the Stress and Focus indices and all scales measuring Speed metrics were within expected ranges, and the individual showed a particular strength in the Speed Index, scoring 468 points of the maximum 500 potential. Percentage values in the NeuroSpeed, Reaction Speed, and Consistency scales were 100%, 90%, and 90%, respectively. Broadly, the NeuroPerformance Profile indicates that the athlete may have the tendency to be cortically overaroused, thus contributing to overthinking and excessive physiological stress responses. An additional common finding when athletes have low stress index scores is a correlation with disruptive sleep patterns. Although the athlete reported minimal sleep disruption, it was later reported that this was a bigger contributor than was initially assessed. He had no basis for subjective assessment, and the NeuroPerformance Profile was rather helpful in indicating the possibility of less than optimal sleep quality. It is interesting to consider these results in conjunction with the TAIS, where it was found that this athlete was most likely to overthink and become frustrated under competitive pressure. In addition, that he reported on the TAIS a high appreciation for situation awareness and no reported problems focusing.

Recommendations were based on expert opinions and in consultation with the athlete while reviewing the NeuroPerformance Profile strengths and areas for improvements. Together it was decided the goal for increasing performance would be to train in the index of NeuroStrength to increase the dynamic range between the athlete's resting state cortical arousal and the activation state cortical arousal. The NeuroStrength protocol is designed to suppress slower frequencies and increase faster frequencies in the frontal bilateral sites and are described elsewhere (Sherlin et al., 2012). This protocol was implemented for 25 sessions, and a subsequent 17 sessions were conducted implementing the Stress Recovery protocol. The Stress Recovery protocol is aimed to inhibit fast frequencies and augment slow–mid spectrum frequencies in the parietal sites bilaterally again described elsewhere (Sherlin et al., 2012).

After the boxer completed 43 sessions of PerformanceBrain Training™, a subsequent NeuroPerformance Profile was conducted 15 months later. The posttraining report demonstrated that many of the athlete's strengths were increased and his impulse control for the entire CPT was improved as he made fewer errors than the initial testing. In addition, in the CPT performance he made improvement in reaction speed variability (from 39 ms to 30.8 ms). It should be noted that the specific CPT used for the NeuroPerformance Profile was chosen because there is no practice effect, meaning the athlete made fewer errors because his impulse control and NeuroStrength continued to improve across the posttraining assessment rather than becoming more familiar with the CPT. We believe this result of decreased reaction speed variability in combination with no significant reduction in reaction speed (296 ms to 301 ms) to illustrate a more consistent strategy and ability for sustaining attention during the CPT. After training, the boxer reported that these techniques were good to bring the focus back in on the objective, ''activation task the man in front of [him]'' and was referring to the man he is fighting. In addition, he spoke of the ever-present pressure for every athlete to gain a competitive edge, and he referred to the PerformanceBrain Training as his ''best-kept secret.''

CONCLUSION

In the current case study, the elite heavyweight boxer experienced concurrent assessment and subsequent mental skills training with a sport psychologist, dietary counseling with a nutritionist aimed specifically at minimizing deficiencies and maximizing the day-to-day physical training required by his technical coach, and assessment and enhancement of brain function through an electroencephalographic assessment and neurofeedback training. Most important, this truly was coordinated training, as all experts responsible for performance enhancements were in constant communication to maximize benefits of training. In addition, it should be noted that these experts in conjunction with the athlete reported the findings to the coaches and trainers who were most involved in the strength and conditioning, and technique and skill development. All parties were working for the comprehensive benefit of the athlete.

With regard to performance outcomes, it can be difficult to narrow down a cause-and-effect relationship between any training tool and sport outcomes; however, we believe that his competitive boxing record reflects his success as well the techniques utilized, as he has yet to be defeated. Although the natural talent of this athlete has been apparent from the beginning, we feel confident that this integrative performance enhancement strategy has contributed to his overall success. Future studies on this approach will benefit from post-training assessments in each area to more clearly demonstrate that improvements in each area were made and correlate with improved sport performance.

Admittedly, the methodology of this research can be criticized on the lack of isolated testing of each experimental variable. However, the success of our approach *requires* the coordination of specialists of each area of performance disciplines (i.e., coaches, psychologists, nutritionists, psychophysiologists, biomechanists, and strength and conditioning experts) to deliver an integrated program of performance support. It is increasingly apparent that none of the components of performance can be considered in isolation any longer. Moreover, it is evident that the interplay between these core areas will provide the next strides in high-performance training. In combination with technical and strength training, the areas mentioned here contribute to a model designed to address each core aspect of the individual athlete, and we believe will lead to the ultimate improvements in sports performance.

REFERENCES

American Dietetic Association, Dietitians of Canada, American College of Sports Medicine, Rodriguez, N. R., Di Marco, N. M., & Langley, S. (2009). American College of Sports Medicine position stand. Nutrition and athletic performance. *Medical Science of Sports Exercise*, *41*, 709–731.

Anderson, M. A., Gieck, J. H., Perrin, D. H., Weltman, A., Rutt, R., & Denegar, C. (1991). The relationship among isometric, isotonic, and isokinetic concentric and eccentric quadriceps and hamstring force and three components of athletic performance. *Journal of Orthopaedic and Sports Physical Therapy*, *14*, 114–120.

Baumeister, J., Reinecke, K., Liesen, H., & Weiss, M. (2008). Cortical activity of skilled performance in a complex sports related motor task. *European Journal of Applied Physiology*, *104*, 625–631.

D'Agostino, R. B., Grundy, S., Sullivan, L. M., & Wilson, P. (2001). Validation of the Framingham coronary heart prediction scores: Results of a multiple ethnic groups investigation. *Journal of American Medical Association*, *286*, 180–187. doi:10.1001/jama.286.2.180

Duffy, F. H., McAnulty, G. B., Jones, K., Als, H., & Albert, M. (1993). Brain electrical correlates of psychological measures: Strategies and problems. *Brain Topography*, *5*, 399–412.

Ford, E. S., Giles, W. H., & Mokdad, A. H. (2004). The distribution of 10-year risk for coronary heart disease among U.S. adults: Findings from the National Health and Nutrition Examination Survey III. *Journal of the American College of Cardiology*, *43*, 1791–1796. doi:10.1016/j.jacc.2003.11.061

Gonzalez, J. T., & Stevenson, E. J. (2012). New perspectives on nutritional interventions to augment lipid utilisation during exercise. *British Journal of Nutrition*, *107*, 339–349.

Harung, H. S., Travis, F., Pensgaard, A. M., Boes, R., Cook-Greuter, S., & Daley, K. (2011). Higher psycho-physiological refinement in world-class Norwegian athletes: Brain measures of performance capacity. *Scandinavian Journal of Medical Science in Sports*, *21*, 32–41.

Hrysomallis, C. (2011). Balance ability and athletic performance. *Sports Medicine*, *41*, 221–232.

Louis, J., Hausswirth, C., Easthope, C., & Brisswalter, J. (2012). Strength training improves cycling efficiency in master endurance athletes. *European Journal of Applied Physiology*, *112*, 631–640.

Nideffer, R. M. (1976). Test of attentional and interpersonal style. *Journal of Personality and Social Psychology*, *34*, 394–404.

Noakes, T. D. (2000). Physiological models to understand exercise fatigue and the adaptations that predict or enhance athletic performance. *Scandinavian Journal of Medicine & Science in Sports*, *10*, 123–145.

Pau, M., Loi, A., & Pezzotta, M. C. (2012). Does sensorimotor training improve the static balance of young volleyball players? *Sports Biomechanics*, *11*, 97–107.

Radovanovic, D., Ponorac, N., Ignjatovic, A., Stojiljkovic, N., Popovic, T., & Rakovic, A. (2011). Specific alterations of physiological parameters in competitive race walkers. *Acta Physiologica Hungarica*, *98*, 449–455.

Schreiner, P. J., Morrisett, J. D., Sharrett, A. R., Patsch, W., Tyroler, H. A., Wu, K., & Heiss, G. (1993). Lipoprotein(a) as a risk factor for preclinical atherosclerosis. *Arteriosclerosis,* *Thrombosis, and Vascular Biology*, *13*, 826–833. doi:10.1161/01.ATV.13.6.826.

Sherlin, L. H., Gervais, M., Talley, C., & Walshe, A. (2011). Comprehensive sport performance program. *Biofeedback*, *39*, 119–122.

Sherlin, L. H., & Hixson, B. (2011). *NeuroPerformance Profile (Version 1.5)* [Computer software]. Los Angeles, CA.

Sherlin, L., Larson, N. C., & Sherlin, R. M. (2012). Developing a performance brain training approach for baseball: A process analysis with descriptive data. *Journal of Applied Psychophysiology and Biofeedback*. Advance online publication. doi:10.1007/s10484-012-9205-2

Simopoulos, A. P. (2007). Omega-3 fatty acids and athletics. *Current Sports Medicine Reports*, *6*, 230–236.

Thompson, T., Steffert, T., Ros, T., Leach, J., & Gruzelier, J. (2008). EEG applications for sport and performance. *Methods*, *45*, 279–288.

Vernon, D. J. (2005). Can neurofeedback training enhance performance? An evaluation of the evidence with implications for future research. *Applied Psychophysiology and Biofeedback*, *30*, 347–364. doi:10.1007/s10484-005-8421-4

Williams, C., & Devlin, J. T. (Eds.). (1992). *Foods, nutrition, and sports performance*. London, UK: E & FN Spon.